TECHNICAL REPORT

ISO/TR 52127-2

First edition

Energy performance of buildings — Building automation, controls and building management —

Part 2: Explanation and justification of ISO 52127-1

Performance énergétique des bâtiments — Automatisation, régulation et gestion technique du bâtiment —

Partie 2: Explication et justification de l'ISO 52127-1

PROOF/ÉPREUVE

Reference number
ISO/TR 52127-2:2020(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 205, *Building environment design*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 247, *Building Automation, Controls and Building Management*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 52127 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The CENSE project, the discussions between CEN and the concerted action highlighted the high page count of the entire package due to a lot of “textbook” information. This resulted in flooding and confusing the normative text.

A huge amount of informative contents should be recorded and available for users to properly understand, apply and nationally adapt the EPB standards.

The detailed technical rules CEN/TS 16629 ask for a clear separation between normative and informative contents:

— to avoid flooding and confusing the actual normative part with informative content;

— to reduce the page count of the actual standard;

— to facilitate understanding of the package.

Therefore each EPB standard should be accompanied by an informative technical report, like this one, where all informative contents is collected.

Table 1 shows the relative position of tis standard within the EPB set of standards.

Table 1 — Position of this standard within the EPD set of standards

	Overarching	**Building (as such)**	**Technical Building System**									
Submodule	**Descriptions**	**Descriptions**	**Descriptions**	**Heating**	**Cooling**	**Ventilation**	**Humidification**	**Dehumidification**	**Domestic Hot waters**	**Lighting**	**Building automation and control**	**PV, wind, ..**
sub1	**M1**	**M2**		**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**
1	General	General	General									
2	Common terms and definitions; symbols, units and subscripts	Building Energy Needs	Needs									
3	Application	(Free) Indoor Conditions without Systems	Maximum Load and Power									
4	Ways to Express Energy Performance	Ways to Express Energy Performance	Ways to Express Energy Performance									
5	Building Functions and Building Boundaries	Heat Transfer by Transmission	Emission and control									
6	Building Occupancy and Operating Conditions	Heat Transfer by Infiltration and Ventilation	Distribution and control									

Table 1 *(continued)*

	Over-arching	Building (as such)	Technical Building System									
Submodule	**Descriptions**	**Descriptions**	**Descriptions**	**Heating**	**Cooling**	**Ventilation**	**Humidification**	**Dehumidification**	**Domestic Hot waters**	**Lighting**	**Building automation and control**	**PV, wind, ..**
sub1	**M1**	**M2**		**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**
7	Aggregation of Energy Services and Energy Carriers	Internal Heat Gains	Storage and control									
8	Building Partitioning	Solar Heat Gains	Generation and control									
9	Calculated Energy Performance	Building Dynamics (thermal mass)	Load dispatching and operating conditions									
10	Measured Energy Performance	Measured Energy Performance	Measured Energy Performance									
11	Inspection	Inspection	Inspection									
12	Ways to Express Indoor Comfort		BMS								x	
13	External Environment Conditions											
14	Economic Calculation											

 PROOF/ÉPREUVE

Energy performance of buildings — Building automation, controls and building management —

Part 2:
Explanation and justification of ISO 52127-1

1 Scope

This document contains information to support the correct understanding, use and adoption of ISO 52127-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 52127-1, *Building Management System — Module M10-12*

ISO 7345, *Thermal insulation — Physical quantities and definitions (ISO 7345:1987)*

ISO 52000-1, *Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7345, ISO 52000-1 and ISO 52127-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Symbols

For the purposes of this document, the symbols given in ISO 52000-1 and ISO 52127-1 apply.

5 Method description

5.1 Effect of building automation and control (BAC) and technical building management (TBM)

The key-role of building automation and control and TBM is to ensure the balance between the desired human comfort - which should be maximal, and energy used to obtain this goal - which should be minimal.

The scope of BAC and TBM covers in accordance with their role from one side all technical building systems (where the effect of the BAC is used in the calculation procedures) and from another side the global optimization of the energy performance of a building.

We could identify several categories of controls:

— Technical building systems specific controls: these controllers are dedicated to the physical chain of transformation of the energy, from generation, to storage, distribution and emission. We find them in the matrix starting with the Modules M3-5 to M9-5 and finishing with M3-8 till M9-8. We could consider that one controller exists by module, but sometimes one controller does the control among several modules. More often, these controllers are communicating between them via a standardized open bus, such as BACnet, KNX or LON.

— BAC used for all or several technical building systems that do multidiscipline (heating, cooling, ventilation, DHW, lighting) optimization and complex control functions. For example, one of them is INTERLOCK, a control function that avoids heating and cooling at the same time.

— If all technical building system are used in the building, we have (depending of the size of the building) a technical building management system. Specific global functions are implemented here and are necessary to reach the key-role mentioned above. Usually, in this case, an interrelation with the building as such (Module M2) will occur, mainly to take in consideration the building needs; for example, due to outside temperature, taking into account the inertia of the building when the control will reach the set point in a room.

In a control system dedicated to a building, in this case BAC and TBM, we can distinguish three main characteristics:

— Control accuracy,

— Control function,

— Control strategy.

Technical building management systems are implemented to realize an overall building operation strategy by interdisciplinary orchestration of building energy systems (heating, cooling, ventilation, lighting) whereas systems are controlled by BAC functions. Further information about control accuracy and control functions can be found in ISO/TR 52120-2. ISO 52120-1 describes two approaches, how to evaluate the contribution of building automation and how to control the energy performance of buildings. This document is dedicated to control strategy and technical building management issues covered by ISO 52127-1.

5.2 Control strategy

The control strategy is applied to achieve a given level of control to reach a goal. Optimal control strategies deliver a desired level of control at a minimum cost. A control strategy could consist of a control function or a group of control functions. An example of a control strategy implemented by a control function is optimum start, optimum stop or night set back described in EN 12098-1 and EN 12098-3. The timer function is described in EN 12098-5.

An example of a control strategy that is carried out by a group of control functions is the control strategy used by intermittence. This function uses several control functions, operation modes, optimum start-stop and timer at the same time. All elements together are called either building profile or user pattern. Usually, to implement such building profile, a TBM is a prerequisite.

The most important control strategy described and implemented in ISO 52120-1 is demand-oriented control. Usually these strategies implement the sense of the energy flow (from generation to emission) with flow of calculation (from building needs to delivered energy). Usually for this complex control strategy, a TBM is necessary with a distributed specific control for each technical building system that communicates in system architecture via a communication standardized bus such as BACnet, KNX or LON.

Explained in more detail, this demand oriented control works as follows: When the comfort is reached in the emission area, the controller from the emission sends the message to the controller in charge of distribution to stop to distribute energy, then the controller in charge of distribution sends the message to the controller in charge of storage to either store the energy or if the storage cannot store more energy, then to send the message to the controller in charge of the generation to stop to generating more energy.

Another important control strategy is the control strategy for multi generators either from the same type (e.g. several boilers) or different types (e.g. a boiler and heat pomp) including also the renewable energy sources. This strategy is described in more detail in the sequencing of multiple generators (BMS function 3) in 5.5.3.

The standards enabling to calculate the effect of BACS and TBM functions on energy consumption use different approaches to calculate this impact.

5.3 Rationale

This method is meant for a detailed energy performance analysis of a building in case detailed information about the building, the HVAC system and especially the type of automation, control and management functions is available and that this information can be applied in a holistic EPB calculation method. The method is used only when a sufficient knowledge about automation, control and management functions used for the building and the energy systems is available. The application of the calculation procedures implies that all automation, control and management functions that are accounted for the operation of a building and its energy systems are known.

5.4 Time steps

5.4.1 General

The method is compatible to any time step:

— yearly,

— monthly,

— hourly,

or the statistical BIN method can be applied.

Apart from the Bin method, this is according to the time-step of the input. Normally it is designed for a monthly or hourly method.

5.4.2 Assumption

It is assumed that a calculation method is available that can be used to quantify the impact of technical building management and building automation and control on the energy performance of a building. The EPBD holistic approach is an appropriate calculation method.

5.4.3 Data input — Item 1

Beside all technical input data providing information about the design and construction of both the building fabric as well as the HVAC systems, further important information is required to evaluate the energy performance of a building, e.g. by applying a holistic calculation approach:

— How to use the building: e.g. occupancy pattern defining comfort requirements and internal gains. This information is provided by Module 2 and is used to calculate energy demands resp. needs of the building.

— How to operate the building energy systems to meet the comfort requirements. Setpoints and runtimes of all the technical systems are managed – either manually or automatically – to ensure maximum energy performance. Automated operation requires communication between the BAC and the TBM system.